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## **DEVICES WITH OPTICAL GAIN IN SILICON**

### **CROSS REFERENCE TO RELATED APPLICATION**

**[0001]** This application is a continuation of U.S. Serial No. 09/924,392 filed August 7, 2001, <sup>Pat 6,134,453</sup> which application claims the benefit of U.S. provisional application serial no. 60/223,874, filed August 8, 2000, both applications of which are fully incorporated herein by reference.

### **BACKGROUND OF THE INVENTION**

#### **Field of Use:**

**[0002]** This invention relates generally to optical switching methods and apparatus, and more particularly to optical switching methods and apparatus that achieve optical gain in silicon.

#### **Description of the Related Art:**

**[0003]** Communication networks increasingly rely upon optical fiber for high-speed, low-cost transmission. Optical fibers were originally envisioned as an optical replacement for electronic transmission media, such as high-speed coaxial cable and lower-speed twisted-pair cable. However, even high-speed optical fibers are limited by the electronics at the transmitting and receiving ends, generally rated at a few gigabits per second, although 40 Gb/s systems have been prototyped. Such high-speed electronic systems are expensive and still do not fully exploit the inherent bandwidth of fiber-optic systems, measured in many terabits per second.

**[0004]** All-optical transmission systems offer many intrinsic advantages over systems that use electronics within any part of the principal transmission path. Wavelength-division multiplexing (WDM) electronically impresses different data signals upon different carrier frequencies, all of which are carried by a single optical fiber. The earliest WDM systems did not provide optical switching but only point-to-point WDM.

**[0005]** To achieve optical gain in a semiconductor metal-organic chemical vapor deposition (MOCVD) and molecular beam epitaxy processes have been used to produce